

The Examiner's Section 101 rejection further violates the established practice courts have laid out for evaluating utility, as summarized in MPEP § 2107.01:

As a matter of Patent Office practice, a specification which contains a disclosure of utility which corresponds in scope to the subject matter sought to be patented must be taken as sufficient to satisfy the utility requirement of § 101 for the entire claimed subject matter unless there is a reason for one skilled in the art to question the objective truth of the statement of utility or its scope. *In re Langer*, 183 USPQ 288, 297 (CCPA 1974) (Emphasis added.)

Thus, the Patent Office must have adequate support for its challenge to the credibility of Applicant's statements as to utility. Only then does the burden shift to Applicant to provide rebuttal evidence. *In re Bundy*, 209 USPQ 48, 51 (CCPA 1981).

Astonishingly, on page 2 of the Office Action, the Examiner not only admits that the experimental evidence was not considered, but that the Examiner is incapable of doing so:

The data presented in the Experimental Section is not conclusive. Its analysis and any judgement upon its significance is outside the scope of the Examiner.

Since the Examiner did not properly consider Applicant's disclosure and supporting experimental evidence in making the Section 101 rejection and has made unfounded conclusions of incredibility, the burden has not yet shifted to Applicant. For these reasons alone, the Section 101 rejection should be withdrawn.

Even if the burden to demonstrate the utility of the claimed invention has shifted, Applicant has provided more than sufficient disclosure of his theory and supporting evidence to meet that burden. The evidentiary standard to be used throughout the prosecution is a preponderance of the totality of the evidence with due consideration to persuasiveness of the arguments. *In re Oetiker*, 24 USPQ2d 1443, 1444 (Fed. Cir. 1992). MPEP § 2107.01 sets forth the procedures for how this burden is to be met:

To do this, Office personnel must provide evidence sufficient to show that the statement of asserted utility would be considered "false" by a person of ordinary skill in the art. Of course, a person of ordinary skill must have the

benefit of both facts and reasoning in order to assess the truth of a statement. This means that if applicant has presented facts that support the reasoning used in asserting a utility, Office personnel must present countervailing facts and reasoning sufficient to establish that a person of ordinary skill would not believe the applicant's assertion of utility. *In re Brana*, 51 F.3d 1560, 34 USPQ2d 1436 (Fed. Cir. 1995). The initial evidentiary standard used during evaluation of this question is a preponderance of the evidence (i.e., the totality of the facts and reasoning suggest that it is more likely than not that the statement of the applicant is false). [Emphasis added.]

The Examiner has provided no countervailing facts and no credible reasoning that the claimed invention lacks utility. The Examiner only provides mere conclusory statements referring to unidentified "laws" of physics that are contradicted by Applicant's lower-energy hydrogen, which "up to now has not been shown to exist." Incredibly, the Examiner goes even further by claiming that such lower-energy states of hydrogen are not possible:

A hydrogen atom with its electron in a lower than "ground state" energy level corresponds to a fractional quantum number (defined in the invention as a hydrino) which, up to now, is not possible by ordinary quantum physics reasoning. (Emphasis added.)

The Examiner has not provided even one shred of evidence as to why lower-energy states of hydrogen are not possible. In contrast, the formation of lower-energy hydrogen is supported by Applicant's written description, including his theory, and the supporting experimental evidence of record. The Examiner's failure to properly consider that evidence renders the rejection under Section 101 fatally defective.

A. Applicant's Novel Catalytic Reaction of Atomic Hydrogen

Applicant's experimental evidence supporting the formation of lower-energy hydrogen is based, in part, on studies of the disclosed catalytic reaction of atomic hydrogen for producing such lower-energy states as described below:

J. R. Rydberg showed that all of the spectral lines of atomic hydrogen were given by a completely empirical relationship:

$$\bar{\nu} = R \left(\frac{1}{n_f^2} - \frac{1}{n_i^2} \right) \quad (1)$$

where $R = 109,677 \text{ cm}^{-1}$, $n_f = 1, 2, 3, \dots$, $n_i = 2, 3, 4, \dots$ and $n_i > n_f$. Bohr, Schrodinger, and Heisenberg each developed a theory for atomic hydrogen that gave the energy levels in agreement with Rydberg's equation.

$$E_n = -\frac{e^2}{n^2 8\pi\epsilon_0 a_H} = -\frac{13.598 \text{ eV}}{n^2} \quad (2a)$$

$$n = 1, 2, 3, \dots \quad (2b)$$

The excited energy states of atomic hydrogen are given by Eq. (2a) for $n > 1$ in Eq. (2b). The $n = 1$ state is the "ground" state for "pure" photon transitions (*i.e.*, the $n = 1$ state can absorb a photon and go to an excited electronic state, but it cannot release a photon and go to a lower-energy electronic state). However, an electron transition from the ground state to a lower-energy state may be possible by a resonant nonradiative energy transfer such as multipole coupling or a resonant collision mechanism. Processes such as hydrogen molecular bond formation that occur without photons and that require collisions are common.¹ Also, some commercial phosphors are based on resonant nonradiative energy transfer involving multipole coupling.²

Applicant proposes that atomic hydrogen may undergo a catalytic reaction with certain atoms and ions such as He^+ which singly or multiply ionize at integer multiples of the potential energy of atomic hydrogen, $m \cdot 27.2 \text{ eV}$ wherein m is an integer. The reaction involves a nonradiative energy transfer to form a hydrogen atom that is lower in energy than unreacted atomic hydrogen that corresponds to a fractional principal quantum number. That is

$$n = \frac{1}{2}, \frac{1}{3}, \frac{1}{4}, \dots, \frac{1}{p}; \quad p \text{ is an integer} \quad (2c)$$

¹ Reference 49. Note that a complete list of the references is provided in Attachment B. Also note that some of the reference numbers have changed from those used in Applicant's earlier-filed Responses.

² Reference 50.

replaces the well-known parameter $n = \text{integer}$ in the Rydberg equation for hydrogen excited states. The $n = 1$ state of hydrogen and the $n = \frac{1}{\text{integer}}$ states of hydrogen are nonradiative, but a transition between two nonradiative states is possible via a nonradiative energy transfer, say $n = 1$ to $n = 1/2$. Thus, a catalyst provides a net positive enthalpy of reaction of $m \cdot 27.2 \text{ eV}$ (i.e., it resonantly accepts the nonradiative energy transfer from hydrogen atoms and releases the energy to the surroundings to affect electronic transitions to fractional quantum energy levels). As a consequence of the nonradiative energy transfer, the hydrogen atom becomes unstable and emits further energy until it achieves a lower-energy nonradiative state having a principal energy level given by Eqs. (2a) and (2c).

**B. Summary of Analytical Studies Experimentally
Confirming the Formation of Lower-Energy Hydrogen**

The central issue facing Examiner is whether Applicant's disclosed catalytic reaction does, in fact, form lower-energy hydrogen, i.e., hydrinos, as predicted by his underlying theory.

Had the Examiner properly considered the experimental evidence already of record confirming the existence of lower-energy hydrogen, the Examiner would not have arbitrarily concluded that Applicant's theory predicting such lower energy states was "not credible." At the risk of having the Examiner continue to ignore such evidence, Applicant presents further argument as to why that record evidence, as well as additional supporting evidence submitted herewith, demonstrates the existence of lower-energy hydrogen.

Applicant has now submitted a multitude of analytical studies experimentally confirming the disclosed novel reaction of atomic hydrogen, which produces hydrogen in fractional quantum states that are at lower energies than the traditional "ground" ($n = 1$) state, a chemically generated or assisted plasma (rt-plasma), and novel hydrino hydride compounds. These studies fall into the following general categories:

extreme ultraviolet (EUV) spectroscopy,³
characteristic emission from catalysis and the hydride ion products,⁴
lower-energy hydrogen emission,⁵
plasma formation,⁶
Balmer α line broadening,⁷
elevated electron temperature,⁸
anomalous plasma afterglow duration,⁹
power generation,¹⁰ and
analysis of chemical compounds.¹¹

All of these studies conclusively demonstrate the existence of hydrinos by different means. Once again, Applicant reminds the Examiner that all such experimental evidence and written discussion relating to the existence of lower-energy hydrogen must be considered, since that information directly refutes the Examiner's stated position to the contrary. Otherwise, it would be blatantly unfair for the Examiner, on the one hand, to allege that lower-energy hydrogen does not exist, yet on the other

³ References 1, 2, 12-18, 20-22, 25, 29, 33-35, 37, and 38.

⁴ References 7, 10, 11, 17, 22, and 25.

⁵ References 13-16, 20, and 21.

⁶ References 1, 2, 7, 10, 17, 22, 25, 29, 33-34, and 36-38.

⁷ References 2, 5, 7, 10, 12-16, 19, and 29.

⁸ References 2, 5, and 12-15.

⁹ References 36-37.

¹⁰ References 5, 10, 14-16, 18-19, 24, 26, and 46-48.

¹¹ References 3, 4, 11, 24, 30, and 40-44.

hand, feel free to ignore any evidence to the contrary. Applicant can hardly imagine a more arbitrary and capricious approach to the examination process than that.

Despite these failings, Applicant presents additional good faith arguments demonstrating how his experimental data – evidence already of record and newly submitted evidence – confirms the existence of lower-energy hydrogen.

One skilled in the art would readily understand and be able to reproduce the real-world analytical studies, including the specific 42 types of studies of Applicant's lower-energy hydrogen technology that have now been made of record in this case. Thirty-four of these corresponding papers have been peer-reviewed and published in scientific Journals. These Journals did not merely publish what Applicant submitted. Rather, the Editor sent out Applicant's submissions to top PhD experts in the field, who were exhaustive in their research, requiring Applicant to conduct further extensive analyses, experimental controls, and additional experiments to further confirm the reported results and conclusions. For those test results that have not yet been peer-reviewed, Applicant verifies those test results by the three Rule 132 Declarations submitted in Attachment A.

For the Examiner's convenience, Applicant summarizes the extensive experimental evidence of record as follows:

(1) the observation of intense extreme ultraviolet (EUV) emission at low temperatures (e.g. $\approx 10^3 K$) from atomic hydrogen and only those atomized elements or gaseous ions which provide a net enthalpy of reaction of approximately $m \cdot 27.2 eV$ via the ionization of t electrons to a continuum energy level where t and m are each an integer (e.g. K , Cs , and Sr atoms and Rb^+ ion ionize at integer multiples of the potential energy of atomic hydrogen and caused emission; whereas, the chemically similar atoms, Na , Mg , and Ba , do not ionize at integer multiples of the potential energy of atomic hydrogen and caused no emission);¹²

(2) the observation of novel EUV emission lines from microwave and glow discharges of helium with 2% hydrogen with energies of $q \cdot 13.6 eV$ where

¹² References 1, 2, 7, 10, 17, 22, 25, 29, 33-34, and 36-38.

$q = 1, 2, 3, 4, 6, 7, 8, 9, 11, 12$ or these lines inelastically scattered by helium atoms in the excitation of $He(1s^2)$ to $He(1s^1 2p^1)$ that were identified as hydrogen transitions to electronic energy levels below the "ground" state corresponding to fractional quantum numbers;¹³

(3) the observation of novel EUV emission lines from microwave and glow discharges of helium with 2% hydrogen at 44.2 nm and 40.5 nm with energies of $q \cdot 13.6 + \left(\frac{1}{n_f^2} - \frac{1}{n_i^2} \right) \times 13.6$ eV where $q = 2$ and $n_f = 2, 4$ $n_i = \infty$ that corresponded to multipole coupling to give two photon emission from a continuum excited state atom and an atom undergoing fractional Rydberg state transition;¹⁴

(4) the identification of transitions of atomic hydrogen to lower energy levels corresponding to lower-energy hydrogen atoms in the extreme ultraviolet emission spectrum from interstellar medium and the sun;¹⁵

(5) the EUV spectroscopic observation of lines by the Institut für Niedertemperatur-Plasmaphysik e.V. that could be assigned to transitions of atomic hydrogen to lower energy levels corresponding to fractional principal quantum numbers and the emission from the excitation of the corresponding hydride ions;¹⁶

(6) the recent analysis of mobility and spectroscopy data of individual electrons in liquid helium which shows direct experimental confirmation that electrons may have fractional principal quantum energy levels;¹⁷

(7) the observation of novel EUV emission lines from microwave discharges of argon or helium with 10% hydrogen that matched those predicted for vibrational

¹³ References 13-16, and 21.

¹⁴ Reference 13.

¹⁵ References 20-21, 32, 45.

¹⁶ Reference 35.

¹⁷ Reference 32.

transitions of $H_2^*[n = 1/4; n^* = 2]^+$ with energies of $\nu \cdot 1.185 \text{ eV}$, $\nu = 17 \text{ to } 38$ that terminated at the predicted dissociation limit, E_D , of $H_2[n = 1/4]^+$,

$$E_D = 42.88 \text{ eV} (28.92 \text{ nm});^{18}$$

(8) the observation of continuum state emission of Cs^{2+} and Ar^{2+} at 53.3 nm and 45.6 nm , respectively, with the absence of the other corresponding Rydberg series of lines from these species which confirmed the resonant nonradiative energy transfer of 27.2 eV from atomic hydrogen to the catalysts atomic Cs or Ar^+ ;¹⁹

(9) the spectroscopic observation of the predicted hydride ion $H^-(1/2)$ of hydrogen catalysis by either Cs atom or Ar^+ catalyst at 407 nm corresponding to its predicted binding energy of 3.05 eV ;²⁰

(10) the observation of characteristic emission from K^{3+} which confirmed the resonant nonradiative energy transfer of $3 \cdot 27.2 \text{ eV}$ from atomic hydrogen to atomic K ;²¹

(11) the spectroscopic observation of the predicted $H^-(1/4)$ ion of hydrogen catalysis by K catalyst at 110 nm corresponding to its predicted binding energy of 11.2 eV ;²²

(12) the observation of characteristic emission from Rb^{2+} which confirmed the resonant nonradiative energy transfer of 27.2 eV from atomic hydrogen to Rb^+ ;²³

¹⁸ Reference 20.

¹⁹ Reference 25.

²⁰ Reference 25.

²¹ Reference 22.

²² References 7 and 22.

²³ Reference 17.

(13) the spectroscopic observation of the predicted $H^-(1/2)$ ion of hydrogen catalysis by Rb^+ catalyst at 407 nm corresponding to its predicted binding energy of 3.05 eV;²⁴

(14) the high-resolution visible spectroscopic observation from rt-plasmas and plasma electrolysis cells of the predicted $H^-(1/2)$ ion of hydrogen catalysis by each of K^+ / K^+ , Rb^+ , Cs , and Ar^+ at 407 nm corresponding to its predicted binding energy of 3.05 eV;²⁵

(15) the observation of $H^-(1/2)$, the hydride ion catalyst product of K^+ / K^+ or Rb^+ , by high-resolution visible spectroscopy as a broad peak at 407.00 nm with a FWHM of 0.14 nm corresponding to its predicted binding energy of 3.0468 eV;²⁶

(16) the observation that the high resolution visible plasma emission spectra in the region of 400.0 nm to 406.0 nm matched the predicted bound-free hyperfine structure lines E_{HF} of $H^-(1/2)$ calculated from the electron g factor as $E_{HF} = j^2 3.0056 \times 10^{-5} + 3.0575 \text{ eV}$ (j is an integer) for $j = 1$ to $j = 37$ to within a 1 part per 10^5 ;²⁷

(17) Rb^+ or $2K^+$ catalysts formed a plasma having strong VUV emission with a stationary inverted Lyman population and emission from $H^-(1/2)$ was observed at 4070.0 Å corresponding to its predicted binding energy of 3.0468 eV with its predicted bound-free hyperfine structure lines $E_{HF} = j^2 3.0056 \times 10^{-5} + 3.0575 \text{ eV}$ (j is an integer) that matched for $j = 1$ to $j = 37$ to within a 1 part per 10^5 ;²⁸

²⁴ Reference 17.

²⁵ References 2, 7, 10-11, 17, 22, and 25.

²⁶ Reference 2 and 7.

²⁷ References 2 and 7.

²⁸ Reference 2.

(18) the observation by the Institut fur Niedertemperatur-Plasmaphysik e.V. of an anomalous plasma and plasma afterglow duration formed with hydrogen-potassium mixtures;²⁹

(19) the observation of anomalous afterglow durations of plasmas formed by catalysts providing a net enthalpy of reaction within thermal energies of $m \cdot 27.28 \text{ eV}$;³⁰

(20) the observation of Lyman series in the EUV that represents an energy release about 10 times that of hydrogen combustion which is greater than that of any possible known chemical reaction;³¹

(21) the observation of line emission by the Institut fur Niedertemperatur-Plasmaphysik e.V. with a 4° grazing incidence EUV spectrometer that was 100 times more energetic than the combustion of hydrogen;³²

(22) the observation of anomalous plasmas formed with Sr and Ar^+ catalysts at 1% of the theoretical or prior known voltage requirement with a light output per unit power input up to 8600 times that of the control standard light source;³³

(23) the observation that the optically measured output power of gas cells for power supplied to the glow discharge increased by over two orders of magnitude depending on the presence of less than 1% partial pressure of certain catalysts in hydrogen gas or argon-hydrogen gas mixtures, and an excess thermal balance of 42 W was measured for the 97% argon and 3% hydrogen mixture versus argon plasma alone;³⁴

(24) the observation that glow discharge plasmas of the catalyst-hydrogen mixtures of strontium-hydrogen, helium-hydrogen, argon-hydrogen, strontium-helium-

²⁹ Reference 1, 36.

³⁰ Reference 1, 36-37.

³¹ References 1, 2, 7, 10, 17, 22, 25, 29, 33-34, and 36-38.

³² Reference 35.

³³ References 26, 29, 33, and 38.

hydrogen, and strontium-argon-hydrogen showed significant Balmer α line broadening corresponding to an average hydrogen atom temperature of 25 - 45 eV; whereas, plasmas of the noncatalyst-hydrogen mixtures of pure hydrogen, krypton-hydrogen, xenon-hydrogen, and magnesium-hydrogen showed no excessive broadening corresponding to an average hydrogen atom temperature of ≈ 3 eV;³⁵

(25) the observation that microwave helium-hydrogen and argon-hydrogen plasmas having catalyst Ar^+ or He^+ showed extraordinary Balmer α line broadening due to hydrogen catalysis corresponding to an average hydrogen atom temperature of 110 - 130 eV and 180 - 210 eV, respectively; whereas, plasmas of pure hydrogen, neon-hydrogen, krypton-hydrogen, and xenon-hydrogen showed no excessive broadening corresponding to an average hydrogen atom temperature of ≈ 3 eV;³⁶

(26) the observation that microwave helium-hydrogen and argon-hydrogen plasmas showed average electron temperatures that were high, 28,000 K and 11,600 K, respectively; whereas, the corresponding temperatures of helium and argon alone were only 6800 K and 4800 K, respectively;³⁷

(27) the observation of significant Balmer α line broadening of 17, 9, 11, 14, and 24 eV from rt-plasmas of incandescently heated hydrogen with K^+ / K^+ , Rb^+ , cesium, strontium, and strontium with Ar^+ catalysts, respectively, wherein the results could not be explained by Stark or thermal broadening or electric field acceleration of charged species since the measured field of the incandescent heater was extremely weak, 1 V/cm, corresponding to a broadening of much less than 1 eV;³⁸

³⁴ Reference 26.

³⁵ References 19, 29, and 33.

³⁶ References 12 and 13.

³⁷ References 12, 13 and 15.

³⁸ Reference 10.

(28) calorimetric measurement of excess power of 20 mW/cc on rt-plasmas formed by heating hydrogen with K^+ / K^+ and Ar^+ as catalysts;³⁹

(29) the Calvet calorimetry measurement of an energy balance of over $-151,000 \text{ kJ/mole } H_2$ with the addition of 3% hydrogen to a plasma of argon having the catalyst Ar^+ compared to the enthalpy of combustion of hydrogen of $-241.8 \text{ kJ/mole } H_2$; whereas, under identical conditions no change in the Calvet voltage was observed when hydrogen was added to a plasma of noncatalyst xenon;⁴⁰

(30) the observation that the power output exceeded the power supplied to a hydrogen glow discharge plasmas by 35-184 W depending on the presence of catalysts from helium or argon and less than 1% partial pressure of strontium metal in noble gas-hydrogen mixtures; whereas, the chemically similar noncatalyst krypton had no effect on the power balance;⁴¹

(31) the observation that with the addition of 3% flowing hydrogen to an argon microwave plasma with an constant input power of 40 W, the gas temperature increased from 400°C to over 750°C; whereas, the 400°C temperature of a xenon plasma run under identical conditions was essentially unchanged with the addition of hydrogen;⁴²

(32) the observation that upon the addition of 10% hydrogen to a helium microwave plasma maintained with a constant microwave input power of 40 W, the thermal output power was measured to be at least 400 W corresponding to a reactor temperature rise from room temperature to 1200 °C within 150 seconds, a power

³⁹ Reference 10.

⁴⁰ Reference 18.

⁴¹ Reference 19.

⁴² Reference 5.

density of 40 MW/m^3 , and an energy balance of at least $-5 \times 10^5 \text{ kJ/mole } H_2$ compared to the enthalpy of combustion of hydrogen of $-241.8 \text{ kJ/mole } H_2$; ⁴³

(33) the differential scanning calorimetry (DSC) measurement of minimum heats of formation of *KHI* by the catalytic reaction of *K* with atomic hydrogen and *KI* that were over $-2000 \text{ kJ/mole } H_2$ compared to the enthalpy of combustion of hydrogen of $-241.8 \text{ kJ/mole } H_2$; ⁴⁴

(34) the isolation of novel hydrogen compounds as products of the reaction of atomic hydrogen with atoms and ions which formed an anomalous plasma as reported in the EUV studies; ⁴⁵

(35) the identification of a novel highly stable surface coating *SiH(1/p)* by time of flight secondary ion mass spectroscopy that showed *SiH*⁺ in the positive spectrum and *H*⁻ dominant in the negative spectrum and by X-ray photoelectron spectroscopy which showed that the *H* content of the *SiH* coatings was hydride ions, *H*⁻ (1/4), *H*⁻ (1/9), and *H*⁻ (1/11) corresponding to peaks at 11, 43, and 55 eV, respectively, and showed that the surface was remarkably stable to air; ⁴⁶

(36) the isolation of novel inorganic hydride compounds such as *KHKHCO*₃ and *KH* following each of the electrolysis and plasma electrolysis of a *K*₂*CO*₃ electrolyte which comprised high binding energy hydride ions that were stable in water with their identification by methods such as (i) ToF-SIMS on *KHKHCO*₃ which showed inorganic hydride clusters *K[KHKHCO*₃]⁺ and a negative ToF-SIMS dominated by hydride ion, (ii) X-ray photoelectron spectroscopy which showed novel peaks corresponding to high binding energy hydride ions, and (iii) proton nuclear magnetic resonance spectroscopy

⁴³ Reference 13.

⁴⁴ Reference 24.

⁴⁵ References 3, 4, 11, 24, 30, and 40-44.

⁴⁶ Reference 3.

which showed upfield-shifted peaks corresponding to more diamagnetic, high-binding-energy hydride ions;⁴⁷

(37) the identification of *LiHCl* comprising a high binding energy hydride ion by time of flight secondary ion mass spectroscopy which showed a dominant H^- in the negative ion spectrum, X-ray photoelectron spectroscopy which showed $H^-(1/4)$ as a new peak at its predicted binding energy of 11 eV, 1H nuclear magnetic resonance spectroscopy which showed an extraordinary upfield-shifted peak of 15.4 ppm corresponding to the novel hydride ion, and powder X-ray diffraction which showed novel peaks;⁴⁸

(38) the identification of novel hydride compounds by a number of analytic methods as such as (i) time of flight secondary ion mass spectroscopy which showed a dominant hydride ion in the negative ion spectrum, (ii) X-ray photoelectron spectroscopy which showed novel hydride peaks and significant shifts of the core levels of the primary elements bound to the novel hydride ions, (iii) 1H nuclear magnetic resonance spectroscopy (NMR) which showed extraordinary upfield chemical shifts compared to the NMR of the corresponding ordinary hydrides, and iv.) thermal decomposition with analysis by gas chromatography, and mass spectroscopy which identified the compounds as hydrides;⁴⁹

(39) the NMR identification of novel hydride compounds MH^*X wherein M is the alkali or alkaline earth metal, X , is a halide, and H^* comprises a novel high binding energy hydride ion identified by a large distinct upfield resonance;⁵⁰

(40) the replication of the NMR results of the identification of novel hydride compounds by large distinct upfield resonances at Spectral Data Services, University of

⁴⁷ References 8, 11, 41, 43, and 44.

⁴⁸ Reference 4.

⁴⁹ References 8, 11, 41, and 43.

⁵⁰ References 4, 24, 30, 40, and 42.

Massachusetts Amherst, University of Delaware, Grace Davison, and National Research Council of Canada;⁵¹ and

(41) the NMR identification of novel hydride compounds MH^* and MH_2^* wherein M is the alkali or alkaline earth metal and H^* comprises a novel high binding energy hydride ion identified by a large distinct upfield resonance that proves the hydride ion is different from the hydride ion of the corresponding known compound of the same composition.⁵²

(42) the NMR, TOF-SIMS, XPS identification of novel hydrino hydride compounds and analysis of chemically-produced plasma by an expert hired by the Liebert Corporation, a division of the well-known and highly-respected Emerson Corporation. According to the expert's own words, he "observed demonstrations of the BlackLight Power (BLP) process and . . . reached the inescapable conclusion that it is based on extraordinary chemical reactions that seem to release extraordinary amounts of energy. . . . It is [his] professional opinion that the BLP process represents a chemical conversion of atomic hydrogen unlike any previously reported [in] the archival scientific literature." Although the expert states that he was skeptical of Applicant's theory, he admitted that the chemical and plasma data did support Applicant's fractional quantum states and that he could offer no other explanation of the data using conventional quantum theory.⁵³

Applicant has not only published, or is in the process of publishing, much of his experimental evidence of lower-energy hydrogen, but he has also presented that experimental evidence at the following 27 open forums, which presentations have been well received by Ph.D. scientists:

⁵¹ Reference 30.

⁵² Reference 30.

⁵³ Reference No. 52.

1. R. Mills, "Novel catalytic reaction of hydrogen as a potential new energy source", Division of Industrial and Engineering Chemistry; Session: Industrial Bio-Based Technology, 222nd American Chemical Society Fall National Meeting, (August 26–30, 2001), Chicago, IL.
2. R. Mills, "Spectroscopic identification of a novel catalytic reaction of hydrogen", Division of Inorganic Chemistry; Session: Catalysis, 222nd American Chemical Society Fall National Meeting, (August 26–30, 2001), Chicago, IL.
3. R. Mills, "Spectroscopic identification of a novel catalytic reaction of hydrogen", Division of Physical Chemistry; Session: Physical Chemistry Poster Session, 222nd American Chemical Society Fall National Meeting, (August 26–30, 2001), Chicago, IL.
4. P. Ray, R. Mills, "Spectroscopic identification of a novel catalytic reaction of hydrogen plasma", Session ET1: Lighting, American Physical Society Meeting, 54th Annual Gaseous Electronics Conference, October 9–12, 2001, Pennsylvania State University, State College, PA.
5. R. Mills, J. He, "Spectroscopic Identification of a Novel Catalytic Reaction of Atomic Hydrogen and the Hydride Ion Product", National Hydrogen Association, 12 th Annual U.S. Hydrogen Meeting and Exposition, *Hydrogen: The Common Thread*, The Washington Hilton and Towers, Washington DC, (March 6-8, 2001).
6. R. Mills, B. Dhandapani, M. Nansteel, N. Greenig, S. Hicks, J. Dong, "Optically Measured Power Balances of Anomalous Discharges of Mixtures of Argon, Hydrogen, and Potassium, Rubidium, Cesium, or Strontium Vapor", National Hydrogen Association, 12 th Annual U.S. Hydrogen Meeting and Exposition, *Hydrogen: The Common Thread*, The Washington Hilton and Towers, Washington DC, (March 6-8, 2001).
7. R. Mills, M. Nansteel, N. Greenig, S. Hicks, "BlackLight Power Technology-A New Clean Energy Source with the Potential for Direct Conversion to Electricity", National Hydrogen Association, 12 th Annual U.S. Hydrogen Meeting and Exposition, *Hydrogen: The Common Thread*, The Washington Hilton and Towers, Washington DC, (March 6-8, 2001).
8. R. Mills, B. Dhandapani, M. Nansteel, J. He, A. Voigt, "Identification of Compounds Containing Novel Hydride Ions by Nuclear Magnetic Resonance Spectroscopy", National Hydrogen Association, 12 th Annual U.S. Hydrogen Meeting and Exposition, *Hydrogen: The Common Thread*, The Washington Hilton and Towers, Washington DC, (March 6-8, 2001).

9. R. Mills, "BlackLight Power Technology-A New Clean Energy Source with the Potential for Direct Conversion to Electricity", *The 8 th Annual Emerald Groundhog Day Investment Forum*, February 1, 2001, Wyndham Franklin Plaza Hotel, Philadelphia, PA, Organized by Emerald Asset Management, Lancaster, PA.
10. R. Mills, "The Grand Unified Theory of Classical Quantum Mechanics", Global Foundation, Inc. Orbis Scientiae entitled *The Role of Attractive and Repulsive Gravitational Forces in Cosmic Acceleration of Particles The Origin of the Cosmic Gamma Ray Bursts*, (29th Conference on High Energy Physics and Cosmology Since 1964) Dr. Behram N. Kursunoglu, Chairman, December 14-17, 2000, Lago Mar Resort, Fort Lauderdale, FL.
11. R. Mills, "BlackLight Power Technology-A New Clean Energy Source with the Potential for Direct Conversion to Electricity", Global Foundation, Inc. conference entitled *Global Warming and Energy Policy*, Fort Lauderdale, FL, November 26-28, 2000.
12. R. Mills, B. Dhandapani, N. Greenig, J. He, J. Dong, Y. Lu, and H. Conrads, "Formation of an Energetic Plasma and Novel Hydrides from Incandescently Heated Hydrogen Gas with Certain Catalysts", August National ACS Meeting (220th ACS National Meeting, Washington, DC, (August 20-24, 2000)).
13. R. Mills, J. He, and B. Dhandapani, "Novel Alkali and Alkaline Earth Hydrides", August National ACS Meeting (220th ACS National Meeting, Washington, DC, (August 20-24, 2000)).
14. R. Mills, B. Dhandapani, N. Greenig, J. He, J. Dong, Y. Lu, and H. Conrads, "Formation of an Energetic Plasma and Novel Hydrides from Incandescently Heated Hydrogen Gas with Certain Catalysts", June ACS Meeting (29th Northeast Regional Meeting, University of Connecticut, Storrs, CT, (June 18-21, 2000)).
15. Mills, J. Dong, N. Greenig, and Y. Lu, "Observation of Extreme Ultraviolet Hydrogen Emission from Incandescently Heated Hydrogen Gas with Certain Catalysts", 219 th National ACS Meeting, San Francisco, California, (March 26-30, 2000).
16. R. Mills, B. Dhandapani, N. Greenig, J. He, J. Dong, Y. Lu, and H. Conrads, "Formation of an Energetic Plasma and Novel Hydrides from Incandescently Heated Hydrogen Gas with Certain Catalysts", 219 th National ACS Meeting, San Francisco, California, (March 26-30, 2000).
17. R. Mills, "Novel Hydride Compound", 219 th National ACS Meeting, San Francisco, California, (March 26-30, 2000).

18. R. Mills, J. He, and B. Dhandapani, "Novel Alkali and Alkaline Earth Hydrides", 219 th National ACS Meeting, San Francisco, California, (March 26-30, 2000).
19. R. Mills, J. Dong, N. Greenig, and Y. Lu, "Observation of Extreme Ultraviolet Hydrogen Emission from Incandescently Heated Hydrogen Gas with Certain Catalysts", National Hydrogen Association, 11 th Annual U.S. Hydrogen Meeting, Vienna, VA, (February 29-March 2, 2000).
20. R. Mills, B. Dhandapani, N. Greenig, J. He, J. Dong, Y. Lu, and H. Conrads, "Formation of an Energetic Plasma and Novel Hydrides from Incandescently Heated Hydrogen Gas with Certain Catalysts", National Hydrogen Association, 11 th Annual U.S. Hydrogen Meeting, Vienna, VA, (February 29-March 2, 2000).
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